Review 10 optimization (max/min)

candidates
1. endpts
2. $f' = \nexists$
3. $f' = 0$

absolute (extrema) only one
plug in candidates to $f(x)$
relative (extrema) could be several
1st der test sign f' graphs with a sentence
2nd der test f'' (++) (−−)
"at" vs "is" $f'=0$ $f'=0$
max at $x=$ max is $y=$
don't say "it"

Mar 6-8:58 AM

Ex 1 Find the maximum value of
$f(x) = \frac{x^3}{3} - 4x$ on $[-1, 4]$

candidates
$x=-1$ $f(-1) = 3^2/3$ $f'(x) = x^2 - 4 = 0$
$x=4$ $f(4) = -16/3$ max is $\frac{16}{3}$
$x=2$ $f(2) = -16/3$
~~$x=-2$~~

$f(x)$ (++) $x=2$

Mar 6-9:48 AM

Ex 2

x	3	4	6	7
$f(x)$	−4	1	5	8

$f(x)$ is continuous, differentiable & monotonic on $[3,8]$. which must be true?

T I $f(8) > 8$
F II $f'(5) > 0$
F III $f'(c) = 3$ for exactly one value of c in $[3,7]$

MVT $f'(c) = \frac{8-4}{7-3} = 3$

Mar 6-10:00 AM

Ex 3 A storm washes sand away from a beach causing the water to get closer to a road at a rate of $f(t) = \sqrt{t} + \cos t - 3$ ft/hr. the storm lasts 5 hours. when the distance between the water and the road decreasing most rapidly?

$t=0$ $f(0) = 1$ $f' = \frac{1}{2\sqrt{t}} - \sin t = 0$
$t=5$ $f(5) = -1.4803$
$t = 0.6619$ $f(0.6619) = -1.3976$
$t = 2.8404$ $f(2.8404) = -2.7697$

Mar 6-10:10 AM